

Science To Aid Of Crews Trapped In Subs

Modern Rescue Ships Watch Over Lives of Valiant Undersea Men

By J. McDowell Morgan

WHEN the fleet is in port, hundreds of sight-seers swarm the waterfront to view the mighty dreadnaughts and other vessels of war, but give scant attention to those ships comprising the train—the supply ships, repair ships and tenders. These auxiliary vessels, although seldom heralded, are the backbone of the fleet. Their utility is indispensable in supporting the battle squadrons at sea, and in times of emergency, or disaster, they prove invaluable.

Amongst this auxiliary force is a small, unarmed vessel, attached to the fleet submarine flotilla, whose outlines resemble that of an ordinary navy tug and, to the casual observer, does not appear to be a ship of much importance. Yet, the duty of this vessel constitutes one of the most heroic undertakings of the sea. It is the U. S. S. Ortolan—fleet submarine rescue and salvage ship.

The rescue ship Ortolan, one of five vessels of its kind now in the naval service, was formerly a mine sweeper, converted for submarine salvage and rescue work by the installation of the latest scientific equipment for deep sea diving. The others, all identically equipped, are stationed at the various submarine bases—New London, Conn.; Coco Solo, Panama; Pearl Harbor, Hawaii, and the Asiatic station at Cavite, P. I.

Nearly one-third of the Ortolan's crew are qualified deep-sea divers, and practically every rating on board, even including a pharmacist's mate, is represented in the diving force. There are, in all, 24 divers, whose qualifications for deep-sea work ranges from 50 to 300 feet—the maximum depth that can be sustained in a regulation diving suit.

THE rescue ship Ortolan accompanies the fleet submarine flotilla wherever it goes—on distant cruises, tactical maneuvers and war games, or torpedo practice. Its role, however, is of little importance to those operations, as it is a non-combatant. It is the duty of the Ortolan to be constantly at hand in the event of an accident to one of the submarines and to effect the rescue of its crew.

But the activities of the submarine flotilla and the rescue ship Ortolan are not confined to fleet maneuvers. In fact the exercises that they conduct between themselves are extraneous to all other operations; for they continuously carry out experimental rescues when not otherwise actively engaged. These experimental rescues play a very important part in the regular functions of the fleet submarines. And the performances are conducted from the depths of the sea with the same realism as if the vessels were actually disabled and resting on the bottom.

Ever since the disasters of the ill-fated submarines U. S. S. S-51, off Block Island, R. I., in 1925, and the U. S. S. S-4 off Provincetown, Mass., in 1927, two of the most shocking peacetime undersea catastrophes in recent years, naval designers have striven to perfect ways and means of rescuing from the deep those who become entrapped in a disabled submarine. In both instances the vessels were rammed by a larger ship and sent plunging to the bottom, causing a dreadful, untimely end to the crews.

Heroic deeds of deep sea divers are legion, but one of the most stirring dramas enacted on the ocean floor took place at the time of the sinking of the S-51, when diver William H. Reed, using an electric arc burner to cut through the engine room hatch of the ill-fated submarine, did the whole job while he was taking a current of heavy amperage through his hands. Reed had neglected taking his insulating gloves, but believed the heavy diving suit provided enough insulation. The current was of low voltage, but the heavy amperage load caused him extreme pain.

"I KNEW it was a matter of life or death for the men inside, whom we believed to be still alive. I knew the voltage was too low to kill me, and I thought I could stand the pain," explained Reed.

Later on the same job, after hours of frantic work below the surface, Reed was hauled up with a leak in his suit, and saved from what might have proved a fatal attack of the "bend" by placing him in a decompression tank.

Because of the contortions of the sufferers, the early divers gave the name of "bends" to the attack. It is caused from the terrific pressure under water, and is the dread of all divers.

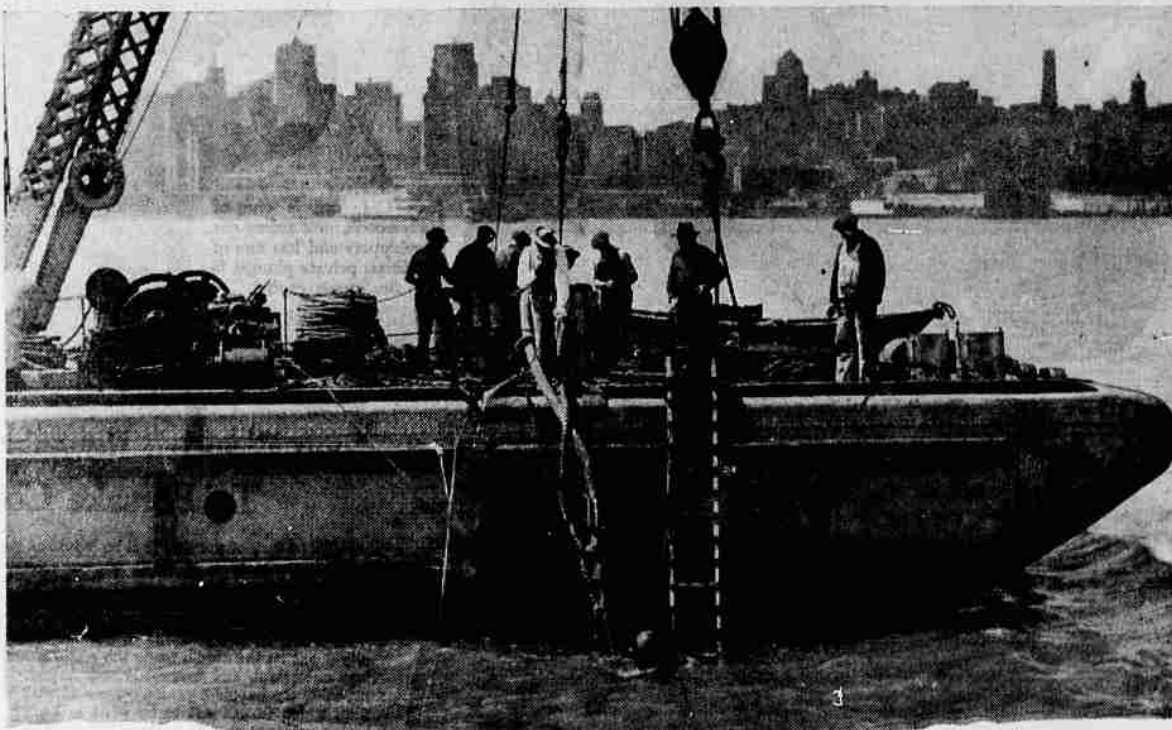
Reed and other intrepid divers are responsible for many heroic rescues. However, their work, more often than not in catastrophes, entails the aid and duty of bringing the dead to the surface.

Such was Reed's duty in the case of the S-51. From subsequent examination after the S-51 was raised, it was conceded that some of the men had evidently survived the crash for several hours before they finally succumbed. But in the case of the S-4, it is a positive fact. At the beginning of rescue operations on the S-4, the divers heard frantic tapping coming from within the vessel's hull and immediately communicated with the imprisoned men by code. They had succeeded in closing the watertight doors of their compartment, but the bulkhead seams had been sprung, and water was seeping through into their dismal tomb. When the divers learned of this predicament, they worked feverishly to give the trapped men aid, but they were powerless to help them. Eventually, after a tortuous duration, the compartment flooded and the few remaining survivors of the S-4 perished.

THE story of those doomed men pounding out their urgent pleas, then, finally, when all hope was given up for rescue, they tapped their farewell messages to be sent to loved ones at home, is one of the most pathetic incidents within the annals of the sea. Still, it is hoped that these men have not died in vain, for it is due to their fate that inventive geniuses were spurred to devising many improvements in both the escape apparatus on board our submarines and improved methods of rescue from the salvage ships. Although the creative ingenuity of man is



Divers going to the rescue of crews trapped in sunken submarines have been known to descend as deep as 300 feet below the surface. Above is pictured a recompression tank, in which divers suffering from the "bends" are given emergency treatment. At the right, Bill Reed prepares for one of his perilous descents. Below, the fleet submarine rescue and salvage ship, U. S. S. Ortolan, sends down a diver. Although unarmed, the Ortolan is an indispensable unit of Uncle Sam's battle squadron at sea.



never infallible, it is safe to say that our present submarine crews can be reasonably certain of being rescued from a disabled ship resting on bottom provided, of course, it is in a depth of not more than 300 feet.

At present there are several methods of effecting a rescue from a submarine in the depths. One of the latest successful means is by self-expulsion from the vessel, using the Momsen lung, a recent development in escape apparatus that functions somewhat like a gas mask. And unless one of our submarines met with an accident that caused total destruction to all compartments, and lay in a depth of not more than 100 feet, the men could leave the vessel and rise to the surface without assistance from the rescue ship. This escape method is now conducted in regular practice on all our submarines. However, the operation has its limitations, for much depends upon their off shore position, the condition of the sea, and the contingency of being picked up by surface craft.

In a practice rescue with the rescue ship Ortolan, the work is carried out just exactly as it would be at a much greater depth. The following is given as a concise illustration:

First the submarine departs from its base and cruises off shore until its commander selects some particular spot along the coast for the performance. Then a prearranged signal is radioed to the Ortolan giving only an approximate position of the submarine in its theoretical distress. As soon as the signal is dispatched, the sub descends to the bottom, turns off all motors, and remains absolutely mute. It is then up to the rescue ship to locate the submerged vessel and accomplish the rescue of its crew.

When the Ortolan arrives within the area given in the signal, it starts on a spiraling circle using an oscillator to detect the submarine lying on the floor of the sea. This oscillator is comparatively termed an echo sounder and is similarly used by most ships for sounding

depths. The electrical impulses go to the bottom and rebound to the ship where they are recorded. In the case of the rescue ship, however, the reflex impulses are distinguished if they rebound from the hull of a sunken steel vessel. Even much smaller objects, such as torpedoes that have sunk in firing practice have been located and recovered through its use—much to the gratification of those who would have been held responsible if they were lost, as torpedoes are valuable and costly machines.

AS SOON as the submarine is located, marker buoys are planted nearby and the rescue ship is moored fore and aft over the spot. A diving stage is then hoisted over the side with one of the divers, and he is lowered away with descending lines to be attached to the submarine. When the diver reaches bottom, he goes aboard the sub and secures the descending lines then returns to the surface. In an actual disaster the diver examines the vessel then reports the extent of the submarine's damage and its position

while resting on the bottom. This information is very important, as the method of rescue depends greatly upon these two circumstances.

Upon the diver's return to the surface, a submarine rescue chamber, a sort of diving bell, is lowered and two divers are sent down to seat the chamber to one of the escape hatches of the submarine. The rescue chamber is so designed that it can be sealed to the escape hatches, and remain watertight, even though the vessel is listing on an angle of 45 degrees. Beyond that it is unemployable. Fifteen men can enter the chamber on each ascent, and the rescue of the crew is effected in comparatively short time.

In the event the rescue chamber cannot be used, air lines are sent down and connected to the valves that lead to the various compartments and the ballast tanks. By this arrangement, the rescue ship can supply air to those in the compartments and blow the tanks. The submarine then automatically rises to the surface. If, however, the submarine is so damaged that it is impossible for the rescue ship to furnish air to those imprisoned below, or to blow the tanks, then it is a foregone conclusion that the men are beyond immediate aid and all efforts are concentrated on salvaging the ship.

Salvage work on a sunken submarine is a very hazardous operation. Witness the raising of the S-51, which took months of heartbreaking work to accomplish. It was the first successful job of its kind ever performed; and the method that was used is still employed for salvaging sunken submarines. In short, it means tunneling under the vessel in order to get slings around its hull to which huge pontoons are secured that will raise it to the surface. The tunneling is done by shooting powerful streams of water from high pressure hose so that the divers can burrow into the sand or mud. The nozzels that are employed are of special design. They were developed and first successfully used in the salvaging of the S-51, and are covered by patent held by the U. S. Navy. Many dangerous hours were spent in the depths by the divers trying to control their hose under the terrific pressures with ordinary nozzels. Then, with the adaption of these especially designed nozzels, the problem was finally solved.

IN PREPARING for tunneling, two divers are lowered into the depths followed by two lengths of high pressure hose. Each diver takes a position on either side of the sunken vessel, and when all is ready, the pumps are started and the two divers commence gouging large holes under the hull. When the divers meet beneath the vessel, a cable is lowered away which is passed through and hauled up to the salvage ship where heavy battleship anchor chains are bent on and sent down. The anchor chains are then reeved under and around the hull making the slings. After the chains are secured, several large steel pontoons are sunk alongside and made fast to the heavy chains. When all is ready, air lines are then sent down and connected to the pontoons which are blown free bringing the ship to the surface. Each pontoon weighs 40 tons and has a lifting capacity of 80 tons.

The dangers involved in actual rescue and salvage operations, however, are not the only risks that the diver undertakes when he goes down. In just the diving alone, with the tremendous pressure of the sea threatening to crush him to pulp, compels the diver to maintain an equal pressure of air in his suit and breathe this compressed air during his entire stay in the deep. Then when he is coming up, and the sea pressure is lessened, his blood stream effervesces like carbonated water, and unless his rise to the surface is taken gradually—that is, take decompression by slow stages—the air bubbles will clog his veins and bring on the "bends," a paralytic stroke known as caisson disease which often effects many divers.

NOT only do the bends attack suddenly and are very painful, but in severe cases are likely to hasten death or cripple its victim for life. To counteract against the bends, each rescue ship has a recompression chamber in which the divers are placed under pressure of compressed air, then gradually decompressed. The recompression chamber is a cylindrical steel tank about 12 feet long and 6 feet in diameter. At one end is a small trap door which enters into a short compartment known as the air-lock; then another door, similar to the first, enters into the main chamber. The air-lock is the intercommunicating passage to the main chamber and is used for undressing the diver as well as entering and leaving the chamber without disturbing the internal pressure.

Up to the present, the recompression chamber is the only thing known to medical science which will cure or even relieve one of the bends. Divers, as well as those working in tunnels beneath river beds, became afflicted with the bends. Many of them have succumbed during their terrible suffering but it was not until the U. S. Navy Diving School made extensive tests and experiments with a recompression tank that a definite solution for its cure and relief was discovered. An exhaustive study was made through these tests with the result that a chart was compiled giving the air pressure to be maintained in the chamber in accordance to the depth and length of time that the diver was on bottom. It was also noted that a diver is subjected to the bends at any time within 24 hours after he has arisen from the depths. In any event, it always means a treatment in the recompression chamber. It is for this reason that divers and those working in tunnels under heavy pressures carry on their person identification cards with instructions to call certain emergency stations in the event they are stricken while away from their work or ship.

Notwithstanding the dangers involved, and contrary to common belief, diving is not necessarily a short lived profession. The Navy has many deep-sea divers whose experience extends over a period of 15 to 20 years—and are still diving! These instances of long service in diving, however, can not be interpreted that their work has been easy. It commendably reflects the high efficiency maintained in the Navy's rigid, scientific training. And it is to these silent, intrepid men of the deep, with their grotesque forms moving slowly but assuredly on the bottom of the sea, that the submarine crews seek succor from their death trap in a sunken, disabled ship.

Wraith of Ancient Warrior Hovers Over Hawaii

By Walter Scratch

NIGHTS when the trade winds howled through a rugged mountain pass near Honolulu, the Hawaiians used to say they could hear the tramp of an army and the whispers of the dead whose bones lay rotting in the guava jungle at the foot of towering Nuuanu Pali.

Those whispers would tell them of a wild night in April, 1795, a night that saw an army pushed over a precipice and a savage chieftain made ruler of all Hawaii.

That night at the Pali (cliff) Kamehameha the conqueror reached the end of a trail of blood that for 13 years had marked his climb to power. An obscure chief, he had warred until half a million people and a mighty chain of islands were under his heel.

Nearly two decades before that night, breathless runners had told Kamehameha that giant canoes were sailing over the southern horizon as his own ancestors had done centuries before to settle Hawaii. When the white sails were furled Kamehameha and his people said their fair God Lono had returned to earth. But when Captain James Cook and his seamen broke the sacred tabus the English explorer died with a dagger through his body.

BY THE time another English navigator, Captain Vancouver, had reached Hawaii, and in 1792 Kamehameha's war canoes had pushed

northward through the islands until Oahu alone defied them. So the canoes swept on again and a horde of Polynesian warriors poured ashore on Oahu, routed the Oahu king from his royal grove at Waikiki, drove his fleeing spearmen into Nuuanu valley and forced them to leap to their deaths from the 1,000-foot precipice at its summit.

But after that night at Nuuanu Pali, Kamehameha welcomed many ships of the white men. Nor did he force them to those who came peacefully to trade some day would hold the power he won at Nuuanu.

After he died in 1819, four more Kamehamehas wore the feather cape of royal power. In the days of these Kamehamehas came missionaries from Boston to banish the wooden idols and tear down the sacred heiaus. There followed whaling ships, fast Yankee clippers for sandalwood, and warships to bully a puny nation.

Once in 1843, British guns frowned on Honolulu harbor and the Union Jack flew over the royal palace. Then Wiley Dr. Judd, Yankee medical missionary who turned statesman, smuggled official records into the royal tomb. There at night, with candles flickering on the royal coffins, Hawaii's government was carried on until the English restored the monarchy.

WHEN the fifth Kamehameha joined his ancestors in 1872, no son survived. His bones were laid with those of three other Kamehame-

has where their armies first won the power that founded their dynasty. There the whispers of dead warriors could tell them of new races which came to replace a dying people and of new kings who lost the kingdom the Kamehamehas had founded.

Three of these monarchs carried on in pomp and splendor as a changing world harassed them. Warships of land-hungry powers prowled their shores. Politics furrowed their brows. Sugar cane waved where forests had been cut from the hillsides, and sugar men bargained for changes that would open to them the American market. So an island queen was pushed aside in 1893 and a republic was founded.

Only two thousand miles away lay the gateway to markets this republic needed. In its midst lay a naval base from which America could protect its west coast. So in 1898 Hawaii hauled down the flag of the republic and raised the Stars and Stripes over the palace of the Kamehamehas.

Nuuanu Pali today is a scenic attraction for tourists. Far below them lie bones of an army that was driven over the cliff to their death to win a kingdom. Old Hawaiians say that the whispers of the dead, are carried across the Pali on the trade winds, but the peaceful tranquility of the lush green valley today is undisturbed except, perhaps for whispers.